CLAIMS:

1. A method, comprising:

a) treating nucleic acid molecules or modified nucleic acids in a sample with a reagent or reagents that render the nucleic acid chains unextendable by a non-template-dependent enzyme; and

b) hybridizing the treated molecules with a nucleic acid probe that includes an extendable terminus, under conditions whereby hybrids form; and

c) treating any hybrids formed with an non-template dependent chain elongating enzyme and substrates therefor, whereby any hybridized probe is extended.

2. The method of claim 1, wherein in step c) the non-template dependent chain elongating enzyme is a telomerase.

3. The method of claim 1, wherein the substrates comprise detectable moieties.

4. A method of detecting a nucleic acid probe added to a sample containing nucleic acids comprising the steps of:

(a) treating the sample with a chain terminating reagent to prevent polynucleotide chain growth from the nucleic acid in the sample;

(b) contacting the sample with the probe containing a terminus capable of elongation by a chain extending enzyme, wherein said probe hybridizes to the nucleic acid in the sample;

(c) contacting the sample with a chain extending enzyme and its substrates, thereby elongating the probe; and

(d) detecting the elongated hybridized probe.

5. The method of claim 4, where in the chain terminating reagent reacts directly with the sample to prevent polynucleotide growth.

6. The method in claim 4, wherein the chain terminating reagent is an enzyme substrate that in the presence of the enzyme reacts directly with the sample to prevent polynucleotide growth.

7. The method of claim 6, wherein the enzyme substrate is a nucleotide lacking a reactive hydroxyl.

8. The method of claim 6, wherein the enzyme substrate is a dideoxynucleotide.

9. The method of claim 4, wherein the chain extending enzyme is a telomerase.

10. The method of claim 4, where in the telomerase is terminal deoxynucleotidyl transferase.

11. The method of claim 4, wherein the chain extending enzyme is a polymerase.

12. The method of claim 4, wherein the chain extending enzyme is a polynucleotide phosphorylase.

13. The method of claim 4, wherein the substrates comprise nucleoside triphosphates labeled with fluorescent moieties.

14. The method of claim 13, wherein the substrate comprises a nucleoside triphosphate labeled with fluorescein dUTP.

15. The method of claim 13, wherein the substrate comprises a nucleoside triphosphate labeled with fluorescein dCTP.

16. The method of claim 4, wherein the substrate is a nucleoside triphosphate comprising a reporter group.

17. The method of claim 4, wherein the substrate is a nucleoside labeled with biotin dUTP.

18. The method of claim 4, wherein the substrate is a nucleoside labeled with digoxigenin dUTP.